Statistics 312 – Probability and Statistics for CEVE
Fall 2015
Class TR 10:50-12:05 DH 1046

Instructor: Dr. Kathy Ensor; x4687; ensor@rice.edu
Office Hours: Monday 2:00 to 3:00 or by appointment

TA: Julia Schedler
Help Session and Office Hours: Wednesday 3:30 – 5:30; location TBA

Textbook options (you only need one):

1. CEVE majors: Probability Concepts in Engineering 2nd Edition, Alfredo H-S. Ang and Wilson H. Tang. *Note – this text is also used in CEVE 313.*
2. Other ENG: Applied Statistics and Probability for Engineers, 6th Edition, Montgomery.
3. Other option: Probability and Statistical Inference, 8th edition, Hogg and Tanus (the 9th edition would be fine as well as earlier editions).

Computing Required: An excellent statistical package called R is available for free. (see http://www.r-project.org/ or simply "google" R). I recommend you access R through the freely available interface RStudio (https://www.rstudio.com). There will be computational assignments throughout the semester; you should strive to become proficient at using the software. There are many on-line resources for learning R such as the Quick-R page http://www.statmethods.net. Uploaded to owlspace is a short reference card (https://cran.r-project.org/doc/contrib/Short-refcard.pdf) and the text "Introduction to Probability and Statistics Using R" by G. Jay Kerns (https://cran.r-project.org/web/packages/IPSUR/vignettes/IPSUR.pdf). We will also provide plenty of examples.

Assessment:

- 75% Tests – given under strict adherence to the honor code – dates subject to change
  - Test 1 --- target date Oct. 5th
  - Test 2 --- target date Nov. 1st
  - Test 3 --- target date Dec. 3rd
  - **Optional Comprehensive** Final Exam; Date- TBA. The final may used to replace your lowest test grade.
- 25% Homework and Quizzes
  - Homework generally due each Thursday at the start of class.
  - Late homework: a 10% deduction occurs if handed in after class and before 5pm on the due date; 20% deduction for each day the assignment is late.
  - Students are encouraged to discuss and collaborate on homework. However, solutions must be written individually unless it is a group assignment.
  - Short in class quizzes and assignments may be given throughout the semester. The quizzes will be a component of the homework grade.

Rice Honor Code

In this course, all students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. If you are unfamiliar with the details of this code and how it is administered, you should consult the Honor System Handbook at http://honor.rice.edu/honor-system-handbook/. This handbook outlines the University's expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process.

Students are encouraged to discuss and collaborate on homework. However, solutions must be written individually unless it is a group assignment. There should be no collaboration on exams.

Disability Support Services

If you have a documented disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Disability Support Services (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

General Course Timeline (will change as necessary):
Week and probability/statistics topic – practical examples and case studies will be used throughout

1. 8/25-27:
    a. Uncertainty Quantification in Engineering; The role of data in the engineering decision process;
    b. The Mathematics of Probability
2. 9/1-3:
    a. Introduction to R / RStudio;
    b. Conditional probability, independence, total probability, Bayes Theorem
3. 9/8-10:
    a. Bayes Theorem;
    b. Decision trees and additional probability based decision examples
4. 9/15-17:
    a. Random variables (discrete and continuous), distributions, percentiles, quantiles, expectations and moment generating functions.
    b. Discrete distributions.
5. 9/22-25:
    a. Discrete and continuous distributions
    b. Continuous distributions
6. 9/29-10/1:
    a. cont.
    b. Exam

7. 10/6-8:
    a. Multivariate distributions, conditional distributions
    b. Bivariate normal distribution and correlation; Covariance and correlation matrix.
8. 10/15:
    a. Functions of random variables
    b. Functions of random variables cont.
9. 10/20-22 Estimation
    a. Population parameters / sample statistics – sampling with and without replacement; Estimator; Sampling distribution.
    b. Types and properties of estimators. Central Limit Theorem.
10. 10/27-29:
    a. The foundation of confidence intervals and test of hypotheses
    b. One sample inference for the population mean, including power and sample size evaluation.
11. 11/3-5:
    a. cont.
    b. Exam
12. 11/10-12:
    a. Comparing two population means
    b. CI and hypothesis tests for proportions
13. 11/17-19:
    a. Distribution tests
    b. Chi-squared goodness of fit test
14. 11/24:
    a. Simple Linear Regression
15. 12/1-3:
    a. cont.
    b. Exam